

REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Final Office Action dated June 21, 2007, and in conjunction with the Request for Continued Examination submitted herewith. In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

As outlined above, claims 21-51 stand for consideration in this application, wherein claims 21, 31 and 37 are being amended to correct formal errors and to more particularly point out and distinctly claim the subject invention.

All amendments to the application are fully supported therein, including but not limited to page 21, lines 22-27, and page 26, line 23 through page 27, line 19. Applicants hereby submit that no new matter is being introduced into the application through the submission of this response.

Prior Art Rejection

The Examiner rejected claims 21-51 under 35 U.S.C. § 103(a) as being unpatentable over Hirakawa et al. (US 2002/0188768) in view of Mogi (US 2003/0229645) and Guha et al. (US 2004/0054939). This rejection is respectfully traversed for the reasons set forth below.

Claim 21 as amended recites that the channel adapter receives a command including a change-over instruction from the computer to be stored in the second upper logical volume, the change-over instruction including information identifying a second inner logical volume of the inner logical volumes to be mapped to the first upper logical volume; the channel adapter maps the second inner logical volume instead of the first inner logical volume to the first upper logical volume in response to the change-over instruction stored in the second upper logical volume, and the channel adapter further operates to start a second set of disk drives from the plurality of disk drives that are mapped to the second inner logical volume; and activation of the second set of disk drives that are mapped to the second inner logical volume starts in response to change-over from the first inner logical volume to the second inner logical volume. The storage control device is configured to change over an inner logical volume mapped to the first upper logical volume from the first inner logical volume to

the second inner logical volume in response to an instruction which is different from a data reading or writing instruction from the computer coupled to the channel adapter (see page 21, lines 22-27, for example, which discloses that there is a logical volume for control which is different from a logical volume for data). With regard to the plurality of disk drives mapping to the first inner logical volume, the storage control device is configured to check whether or not an other inner logical volume are mapped to an error check and correction (ECC) group concerning the plurality of disk drives in response to change-over from the first inner logical volume to the second inner logical volume, and then if the other inner logical volume are not mapped to the ECC group then the activation of the plurality of disk drives stops (see for example page 26, line 23 through page 27, line 19).

Claim 31 is directed to a storage system coupled to a computer, comprising: an interface coupled to the computer; a plurality of disk drives; a plurality of upper volumes for the computer; and a plurality of inner volumes which are mapped to the plurality of disk drives, wherein a first upper volume of the plurality of upper volumes is mapped to a first inner volume of the plurality of inner volumes so as to access the first inner volume by the computer, wherein, in response to receiving an access command at the interface from the computer for accessing the first upper volume of the plurality of upper volumes, the first inner volume mapped to the first upper volume is accessed by the computer via the first upper volume. The first upper volume is mapped to a second inner volume of the plurality of inner volumes instead of the first inner volume in response to receiving an instruction from the computer to assign the second inner volume to the first upper volume such that the second inner volume is accessed by the computer via the first upper volume in response to receiving the access command at the interface for accessing the first upper volume. The activation of disk drives that are mapped to the second inner logical volume starts in response to change-over from the first inner logical volume to the second inner logical volume. The storage control device is configured to change over an inner logical volume mapped to the first upper logical volume from the first inner logical volume to the second inner logical volume in response to an instruction which is different from a data reading or writing instruction from the computer coupled to the channel adapter, and with regard to the plurality of disk drives mapping to the first inner logical volume, the storage control device is configured to check whether or not an other inner logical volume are mapped to an error check and correction (ECC) group concerning the plurality of disk drives in response to change-over from the first inner logical volume to the second inner logical volume, and then if the other inner logical

volume are not mapped to the ECC group then the activation of the plurality of disk drives stops.

Further, claim 37 is directed to storage control system operatively coupled to an external device, comprising: a channel adaptor operatively coupled to the external device and configured to provide access to and from a plurality of upper logical volumes; a memory operatively coupled to the channel adaptor to store at least configuration information for configuration of the storage control system; a disk adaptor operatively coupled to the channel adaptor and the memory to control reading and writing of the data from/to the memory and to provide a plurality of inner logical volumes being used to store data for transmission and reception between the channel adapter and the disk adaptor; and a plurality of disk drives operatively coupled to the disk adaptor, wherein a first inner logical volume of the inner logical volumes is mapped to a first upper logical volume of the upper logical volumes and is mapped to a first set of disk drives of the plurality of disk drives, and a second upper logical volume of the upper logical volumes is configured to receive a change-over instruction from the external device. The channel adaptor is configured to receive the change-over instruction by using the second upper logical volume, the change-over instruction including information identifying a second inner logical volume of the plurality of inner logical volumes to be mapped to the first upper logical volume. The channel adaptor is further configured to map the second inner logical volume instead of the first inner logical volume to the first upper logical volume in response to the change-over instruction received at the second upper logical volume. The disk adaptor is further configured to operate a second set of disk drives of the plurality of disk drives that are mapped to the second inner logical volume after that the first upper logical volume is mapped to the second inner logical volume instead of the first inner logical volume, and activation of the second set of disk drives that are mapped to the second inner logical volume starts in response to change-over from the first inner logical volume to the second inner logical volume. The storage control device is configured to change over an inner logical volume mapped to the first upper logical volume from the first inner logical volume to the second inner logical volume in response to an instruction which is different from a data reading or writing instruction from the computer coupled to the channel adapter. With regard to the plurality of disk drives mapping to the first inner logical volume, the storage control device is configured to check whether or not an other inner logical volume are mapped to an error check and correction (ECC) group concerning the plurality of disk drives in response to change-over from the first inner logical volume to the second inner logical

volume, and then if the other inner logical volume are not mapped to the ECC group then the activation of the plurality of disk drives stops.

As admitted by the Examiner, Hirakawa does not show or suggest multiple layers of logical volumes, namely upper logical volumes and inner logical volumes. Hirakawa merely shows remapping logical volumes in one layer, namely, remapping physical addresses of destinations of the logical volume (paragraph [0041] on page 3). Mogi was cited for showing hierarchical volumes, multiple inner logical volumes and upper logical volumes mapped to the inner logical volumes. Also, as admitted by the Examiner, both Hirakawa and Mogi fail to show or suggest starting a second set of disk devices and second upper volumes to store changeover instructions. Guha was cited for showing the starting/stopping of disk devices and that the configuration information regarding I/O operations and disk drive operational transitions are kept as metadata volume.

Applicants have reviewed the above rejection, and hereby respectfully traverse. In contrast to the present invention as now claimed, none of the cited references as noted above teaches or suggests, among other features, the above-noted features of the present invention. Specifically, as noted above, both Hirakawa and Mogi fail to show or suggest starting a second set of disk devices and second upper volumes to store changeover instructions. Guha merely discloses an I/O reading request and an I/O writing request as instructions from a host computer (see paragraphs [0128]-[0131]). Further, Guha merely discloses that the storage system processes to turn on and off the power of a HDD on only the inside of the storage system (see paragraphs [0128]-[0131], [0135]). Even more, Guha merely shows that a subset of disk drives are powered on when the data in the subset of the disk drive is accessed, while the other subset of the disk drives are powered off on when the data in the other subset of disk drives is not accessed (paragraph [0029] on page 2).

Consequently, Guha cannot and does not disclose or suggest any structure or operation even remotely similar to “the storage control device is configured to change over an inner logical volume mapped to the first upper logical volume from the first inner logical volume to the second inner logical volume in response to an instruction which is different from a data reading or writing instruction from the computer coupled to the channel adapter,” or “with regard to the plurality of disk drives mapping to the first inner logical volume, the storage control device is configured to check whether or not an other inner logical volume are mapped to an error check and correction (ECC) group concerning the plurality of disk drives in response to change-over from the first inner logical volume to the second inner logical

volume, and then if the other inner logical volume are not mapped to the ECC group then the activation of the plurality of disk drives stops.”

Even if Guha were combined with Hirakawa and Mogi, their combination would still fall short of at least showing or suggesting any structure or operation even remotely similar to those of the present invention, as discussed above. The above references would still have the same deficiencies, whether or not they are cited individually or in combination with one another. Therefore, one of ordinary skill in the art would not have turned to Hirakawa, Mogi and Guha, nor to their combination, in order to achieve a structure or operation that embodies all the features of the present invention as now claimed. The present invention as a whole is distinguishable and thereby allowable over the cited prior art.

As to dependent claims 22-30, 32-26 and 38-51, the arguments set forth above with respect to independent claim 21, 31 and 37 are equally applicable here. The corresponding base claim being allowable, claims 22-30, 32-26 and 38-51 must also be allowable.

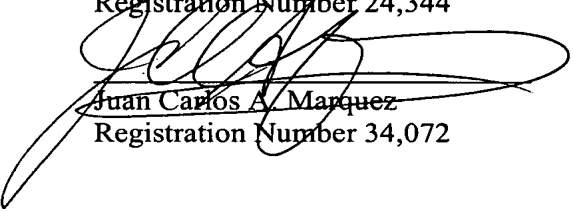
Conclusion

In view of all the above, Applicants respectfully submit that certain clear and distinct differences as discussed exist between the present invention as now claimed and the prior art references upon which the rejections in the Office Action rely. These differences are more than sufficient that the present invention as now claimed would not have been anticipated nor rendered obvious given the prior art. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicants' undersigned representative at the address and phone number indicated below.

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